

Jonathon Matuszak
LEED AP O+M

Creating a
Building
Operating Plan
& Preventive
Maintenance
Schedule

LEED Overview

- USGBC Founded in 1993 as non-profit trade organization.
- Best Known For LEED-Green Buildings rating system (Leadership in Energy & Environmental Design)
- 9 LEED ratings systems: New Construction, Existing Buildings O+M, Commercial Interiors, Core & Shell, Schools, Retail, Healthcare, Homes, Neighborhood Dev.
- LEED Levels: Certified-40-49 Silver-50-59 Gold-60-79 Platinum-80+

8 Credentials For LEED

- LEED Green Associate
- LEED AP Building Design & Construction
- LEED AP Operations & Maintenance
- LEED AP Interior Design & Construction
- LEED AP Homes
- LEED AP Neighborhood Development
- LEED AP Without Specialty
- LEED Fellow
- ALL Credentials Issued by GBCI
(*Green Building Certification Institute*)

LEED Categories O&M

LEED 2009 FOR EXISTING BUILDINGS: OPERATIONS & MAINTENANCE PROJECT CHECKLIST

Sustainable Sites

<input type="checkbox"/> Credit 1	LEED Certified Design and Construction	4
<input type="checkbox"/> Credit 2	Building Exterior and Hardscape Management Plan	1
<input type="checkbox"/> Credit 3	Integrated Pest Management, Erosion Control, and Landscape Management Plan	1
<input type="checkbox"/> Credit 4	Alternative Commuting Transportation	3-15
<input type="checkbox"/> Credit 5	Site Disturbance—Protect or Restore Open Habitat	1
<input type="checkbox"/> Credit 6	Stormwater Quantity Control	1
<input type="checkbox"/> Credit 7.1	Heat Island Reduction—Nonroof	1
<input type="checkbox"/> Credit 7.2	Heat Island Reduction—Roof	1
<input type="checkbox"/> Credit 8	Light Pollution Reduction	1

26 Possible Points

Water Efficiency

<input checked="" type="checkbox"/> Prerequisite 1	Minimum Indoor Plumbing Fixture and Fitting Efficiency	Required
<input type="checkbox"/> Credit 1	Water Performance Measurement	1-2
<input type="checkbox"/> Credit 2	Additional Indoor Plumbing Fixture and Fitting Efficiency	1-5
<input type="checkbox"/> Credit 3	Water Efficient Landscaping	1-5
<input type="checkbox"/> Credit 4	Cooling Tower Water Management	1-2

14 Possible Points

Energy and Atmosphere

<input checked="" type="checkbox"/> Prerequisite 1	Energy Efficiency Best Management Practices—Planning, Documentation, and Opportunity Assessment	Required
<input checked="" type="checkbox"/> Prerequisite 2	Minimum Energy Efficiency Performance	Required
<input checked="" type="checkbox"/> Prerequisite 3	Fundamental Refrigerant Management	Required
<input type="checkbox"/> Credit 1	Optimize Energy Efficiency Performance	1-18
<input type="checkbox"/> Credit 2.1	Existing Building Commissioning—Investigation and Analysis	2
<input type="checkbox"/> Credit 2.2	Existing Building Commissioning—Implementation	2
<input type="checkbox"/> Credit 2.3	Existing Building Commissioning—Ongoing Commissioning	2
<input type="checkbox"/> Credit 3.1	Performance Measurement—Building Automation System	1
<input type="checkbox"/> Credit 3.2	Performance Measurement—System Level Metering	1-2
<input type="checkbox"/> Credit 4	On-site and Off-site Renewable Energy	1-6
<input type="checkbox"/> Credit 5	Enhanced Refrigerant Management	1
<input type="checkbox"/> Credit 6	Emissions Reduction Reporting	1

35 Possible Points

Materials and Resources

<input checked="" type="checkbox"/> Prerequisite 1	Sustainable Purchasing Policy	Required
<input checked="" type="checkbox"/> Prerequisite 2	Solid Waste Management Policy	Required
<input type="checkbox"/> Credit 1	Sustainable Purchasing—Ongoing Consumables	1
<input type="checkbox"/> Credit 2	Sustainable Purchasing—Durable Goods	1-2
<input type="checkbox"/> Credit 3	Sustainable Purchasing—Facility Alterations and Additions	1
<input type="checkbox"/> Credit 4	Sustainable Purchasing—Reduced Mercury in Lamps	1
<input type="checkbox"/> Credit 5	Sustainable Purchasing—Food	1

10 Possible Points

<input type="checkbox"/> Credit 6	Solid Waste Management—Waste Stream Audit	1
<input type="checkbox"/> Credit 7	Solid Waste Management—Ongoing Consumables	1
<input type="checkbox"/> Credit 8	Solid Waste Management—Durable Goods	1
<input type="checkbox"/> Credit 9	Solid Waste Management—Facility Alterations and Additions	1

Indoor Environmental Quality

<input checked="" type="checkbox"/> Prerequisite 1	Minimum Indoor Air Quality Performance	Required
<input checked="" type="checkbox"/> Prerequisite 2	Environmental Tobacco Smoke (ETS) Control	Required
<input checked="" type="checkbox"/> Prerequisite 3	Green Cleaning Policy	Required
<input type="checkbox"/> Credit 1.1	Indoor Air Quality Best Management Practices—Indoor Air Quality Management Program	1
<input type="checkbox"/> Credit 1.2	Indoor Air Quality Best Management Practices—Outdoor Air Delivery Monitoring	1
<input type="checkbox"/> Credit 1.3	Indoor Air Quality Best Management Practices—Increased Ventilation	1
<input type="checkbox"/> Credit 1.4	Indoor Air Quality Best Management Practices—Reduce Particulates in Air Distribution	1
<input type="checkbox"/> Credit 1.5	Indoor Air Quality Best Management Practices—Indoor Air Quality Management for Facility Alterations and Additions	1
<input type="checkbox"/> Credit 2.1	Occupant Comfort—Occupant Survey	1
<input type="checkbox"/> Credit 2.2	Controllability of Systems—Lighting	1
<input type="checkbox"/> Credit 2.3	Occupant Comfort—Thermal Comfort Monitoring	1
<input type="checkbox"/> Credit 2.4	Daylight and Views	1
<input type="checkbox"/> Credit 3.1	Green Cleaning—High Performance Cleaning Program	1
<input type="checkbox"/> Credit 3.2	Green Cleaning—Custodial Effectiveness Assessment	1
<input type="checkbox"/> Credit 3.3	Green Cleaning—Purchase of Sustainable Cleaning Products and Materials	1
<input type="checkbox"/> Credit 3.4	Green Cleaning—Sustainable Cleaning Equipment	1
<input type="checkbox"/> Credit 3.5	Green Cleaning—Indoor Chemical and Pollutant Source Control	1
<input type="checkbox"/> Credit 3.6	Green Cleaning—Indoor Integrated Pest Management	1

15 Possible Points

Innovation in Operations

<input type="checkbox"/> Credit 1	Innovation in Operations	1-4
<input type="checkbox"/> Credit 2	LEED Accredited Professional	1
<input type="checkbox"/> Credit 3	Documenting Sustainable Building Cost Impacts	1

6 Possible Points

Regional Priority

<input type="checkbox"/> Credit 1	Regional Priority	1-4
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4 Possible Points

LEED 2009 for Existing Buildings: Operations & Maintenance

100 base points; 6 possible Innovation in Operations and 4 Regional Priority points

Certified	40–49 points
Silver	50–59 points
Gold	60–79 points
Platinum	80 points and above

Energy & atmosphere prerequisite 1-Eap1

ENERGY & ATMOSPHERE

EA Prerequisite 1: Energy Efficiency Best Management Practices—Planning, Documentation and Opportunity Assessment

Required

Intent

To promote continuity of information to ensure that energy-efficient operating strategies are maintained and provide a foundation for training and system analysis.

Requirements

Document the current sequence of operations for the building.

Develop a building operating plan that provides details on how the building is to be operated and maintained. The operating plan must include, at a minimum, an occupancy schedule, equipment run-time schedule, design set points for all HVAC equipment, and design lighting levels throughout the building. Identify any changes in schedules or set points for different seasons, days of the week and times of day. Validate that the operating plan has been met during the performance period.

Develop a systems narrative that briefly describes the mechanical and electrical systems and equipment in the building. The systems narrative must include all the systems used to meet the operating conditions stated in the operating plan, including at a minimum, heating, cooling, ventilation, lighting and any building controls systems.

Create a narrative of the preventive maintenance plan for equipment described in the systems narrative and document the preventive maintenance schedule during the performance period.

Conduct an energy audit that meets the requirements of the ASHRAE Level I walk-through assessment.

Potential Technologies & Strategies

Prepare a building operating plan that specifies the current operational needs of the building and identify building systems and other practices necessary to meet those needs. Outline the current sequence of operations to identify and eliminate any inefficiency.

Develop and implement a preventive maintenance program to regularly monitor and optimize the performance of mechanical equipment regulating indoor comfort and the conditions delivered in occupied spaces.

Prescott LEED Project



- Built it 1891
- Sq. Ft. 51,000
- 2 Steam boilers
- 1 Air Handler
- Cooling: Window Units
- Engineer: Dan Vela
- Principal: Erin Roach
- LEED Goal EB O+M
- Status: Incomplete
- Completion date:
Unknown

What is a Building Operating Plan?

- o A Snapshot of how the building is being operated at any given time.

What information is Included in a Building Operating Plan?

- Occupancy Levels
- Desired Indoor conditions or Set points
(temps, Relative humidity levels, CO2 levels)
- Duct Static Pressures
- Day vs. Night
- Occupied vs. Unoccupied
- Lighting Levels
- Seasonal Variations

Why Do I Want a Building Operating Plan?

- Gives Owner an idea of how building is being used
- Explain Energy Usage
- Justify Energy Usage
- Gives bldg. operator default settings to operate building

Prescott Operating Plan

	Classrooms	Library	Offices	Kitchen
Heating Occupied	68 deg. F	68 deg. F	68 deg. F	68 deg. F
Heating Unoccupied	55 deg. F	55 deg. F	55 deg. F	55 deg. F
Cooling Occupied	76 deg. F	76 deg. F	76 deg. F	N/A
Cooling Unoccupied	OFF	OFF	OFF	N/A
Ventilation	Unknown air volume at this time			
School Year Schedule				
Mon-Fri 6:00am-7:30 am	5% occupied	5% occupied	5% occupied	5% occupied
	Classrooms	Library	Offices	Kitchen
Mon-Fri 7:30-4:30 p	95% Occupied	95% Occupied	95% Occupied	95% Occupied

Prescott Operating Plan Pg. 2

School Year Schedule					
Mon-Fri 6:00am-7:30 am	5% occupied	5% occupied	5% occupied	5% occupied	
	Classrooms	Library	Offices	Kitchen	
Mon-Fri 7:30- 4:30 p	95% Occupied	95% Occupied	95% Occupied	95% Occupied	
Mon-Fri 4:30pm-9:00 pm	10% occupied	10% occupied	10% occupied	10% occupied	
Sat. & Sun.	Unoccupied	Unoccupied	Unoccupied	Unoccupied	
Summer 2012 Schedule					

Prescott Operation Plan Pg. 3

Mon-Fri 7:30a – 1:00p	50% Occupied	50% Occupied	50% Occupied	50% Occupied	
Mon.- Fri. 1:00p-4:30p	10% Occupied	10% Occupied	10% Occupied	10% Occupied	
Sat. & Sun.	Unoccupied	Unoccupied	Unoccupied	Unoccupied	

All operating procedures are in accordance with the CPS energy Policy

Building Operating Plan Examples

Building Operation Plan Requirements

Equipment Inventory and Run Time Schedules

Building:	
Responsible Building Operator:	
Last Update:	

Item Description	Occupied Hours Week days	After Hours Week days	Weekends and Holidays	Vacation Periods
[Examples]				
PU-1 (Room 101)				
RTU-1 (Rooms 102, 103, 104, 105)				
AHU-01 (Building 06)				
AHU-02 (Wing A, 2nd Floor)				
DX-1				
Chiller (250 t)				
Cooling Tower				
Boiler #1 (Natural Gas)				
Parking lot lights				
Overhead walkway lights				
Tennis court lights				
Field lights				

Building Operating Plan [Template]

Building Operation Plan Requirements

General Requirements for All Spaces

Description of Requirement	Classrooms	Offices	Media Center	Kitchen
1. Cooling Season Temperature				
2. Heating Season Temperature				
3. Humidity Levels				
4. Air Pressure Relationships				
5. Air Filters				
6. Outside Air Ventilation				
7. Air Changes				
8. Interior Lighting Levels				

Description of Requirement	Gymnasium	Auditorium	Cafetorium	Other
1. Cooling Season Temperature				
2. Heating Season Temperature				
3. Humidity Levels				
4. Air Pressure Relationships				
5. Air Filters				
6. Outside Air Ventilation				
7. Air Changes				
8. Interior Lighting Levels				

How Do I create a Building Operating Plan?

- Obtain a copy of CPS Energy Policy
- Create Table (*Or use a pre-printed one*)
- Fill in table with information from existing Asset form

Creating a PM Schedule

PM Narrative

Gage Park H.S. Maintenance Plan 2012

The following is a maintenance plan for Gage Park H.S. I believe this plan to be comprehensive in its detail, includes all relevant and required data per CPS Asset Management specifications, and will serve both the writer and CPS Operations as a guide to the current and future state of the facilities at Gage Park H.S.

Gage Park is currently staffed by 3 stationary engineers and 9 custodians. One of the engineers is assigned during the evening hours to supervise the 7 Custodial workers assigned at night. The day crew consists of 2 engineers and 2 custodial workers.

Jonathon Matuszak- Chief Engineer, Gage Park H.S. 11/14/11

I. Preventive Maintenance goals:

A. Mechanical

1. Replace all filters on a quarterly/as needed basis
2. Oil and/or grease all motors and pumps bi-annually.
3. Check for proper operation & Lubricate all dampers and damper motors annually.
4. Keep boilers up to date per City of Chicago yearly inspections.
5. Grease/oil rooftop exhaust fans. Check belts, change if worn.
6. Check all steam traps for proper operation, replace/repair as necessary.
7. Inspect all heat exchange equipment; AHU coils, package coils in basement tunnels, inspect all pneumatic lines for wear and/or leakage.
8. Change compressor oil, check compressor for proper operation. Inspect dryer for proper operation. Check oil level regularly during heating season to insure proper oil level.
9. Check water levels on all battery operated floor maintenance equipment. Fill when necessary; check that all electrical connections are secure.
10. Maintain all door locks, adjust door closers, and make keys when requested by administration. Control key distribution to insure a safe and secure bldg.

11. Check chlorine and PH levels in swimming pool daily. Adjust chlorine and PH pump accordingly to insure proper chemical levels for swimming.
12. Check pool heater for correct swimming pool temperature of 82 Deg. F. Make necessary adjustments to heater.
13. Check pool filter inlet & outlet pressure and backwash when necessary.
14. Check pool water level and re-fill pool to compensate for loss due to backwashing, evaporation, or leaks in pool liner.
15. Check Dectron dehumidification unit for proper operation. Make adjustments per manufacturer's recommendations.
16. Inspect glycol storage & circulating unit and pump. Take necessary measures to insure proper glycol percentage in water.
17. Check pool access door to make sure pool is locked at all times.
18. Check showers in Boys and Girls locker rooms to insure safe temperature for students to shower before entering pool.
19. Check for safe operation of freight elevator and call in appropriate tradesmen when elevator safety is in question.

B. Electrical

1. Replace weak, worn, or broken circuit breakers to insure sufficient power for proper operation of bldg.
2. Check (touch) all electric motors for proper operation. Repair and/or replace when necessary.
3. Replace cracked, missing, or broken outlets on campus.
4. Regularly (daily) check all lighting. Replace burned out tubes, broken plastic covers, lamps holders, and ballasts/and or wiring when burned or broken.
5. Practice electrical safety with Assistant Engineers & Custodial workers.

C. Exterior Envelope

Various PM Programs

- Most Popular are CMMS (*Computerized Maintenance Management Systems*)
- Asset Point (Enterprise Asset Management EAM)
- PM Expert
- Keep Track
- Make Your Own

Master PM Schedule

Gage Park 2012 Preventive Maintenance Schedule

<i>Equip.</i>	<i>Daily</i>	<i>Weekly</i>	<i>Monthly</i>	<i>Quarterly</i>	<i>Bi-Annually</i>	<i>Annually</i>
Boilers	Blow down boiler	Inspect Linkages	Check all Re-sets	Oil motors & linkages		City Inspection
AHU's	Visually inspect for proper operation	Check belt for proper tension	Apply belt dressing as needed	Grease motor		
Exhaust Fans	Visually inspect for proper operation		Check belt for proper tension	Grease motor	Apply belt dressing as needed	Change belt
Filters		Visually inspect		Change filters		
Window A/C units	Visually inspect for proper operation		Washout filter during cooling season		Cover/uncover units at beginning & end of season	
Thermostats	Inspect for proper operation					Calibrate & check for proper air pressure
Condensate return pumps	Observe unit for proper operation			Grease motor		Check all electrical connections
Steam Traps	Observe for proper operation					Check with thermometer for proper operation
Supply & Return grilles						Vacuum grille & check screws holding grille
Air compressor	Check for proper operating pressure	Check for proper oil level	Check belt for proper tension		Apply belt dressing as needed	Change Oil & filter Change belt
Dectron Unit	Check Unit For proper operation	Check Belts	Wash out & Change Filters	Grease Motor Bearings		Change Belts

Individual PM Schedules

2012 Boiler Feed Pump PM Schedule

Date	Serviced By:	Pump #1	Pump #2	Daily	Quarterly	Annually
<i>Gage Park High School</i>	Eng. On Duty			Inspect Unit for proper operation	Grease Motor & pump	Check all electrical connections
Jan.					*	*
Feb.						
March						
April					*	
May						
June						
July					*	
August						
Sept.						
Oct.					*	
Nov.						
Dec.						

PM's For Every Piece of Equipment

2012 Condensate Return Station # 10 PM schedule

2012 Compressor PM Schedule

Date	Serviced By:	Compressor #1	Compressor #2	Daily	Weekly	Annually
<i>Gage Park High School</i>	Eng. On Duty			Check unit for proper operation	Check oil levels on both compressors	*Change compressor oil
Jan.						
Feb.						
March						
April						
May						
June						
July						
August						
Sept.						
Oct.						
Nov.						
Dec.						

*Oil changed During Summer Months

	Serviced By:	Daily	Quarterly	Annually
Month	Engineer On Duty	Observe Unit for proper operation	Grease motors & pumps	Check all electrical connections
January * *			*	**
February				
March				
April *			*	
May				
June				
July *			*	
August				
September				
October *			*	
November				
December				

Prescott PM Schedule

Prescott Preventive Maintenance Schedule

<i>Equip.</i>	<i>Daily</i>	<i>Weekly</i>	<i>Monthly</i>	<i>Quarterly</i>	<i>Bi-Annually</i>	<i>Annually</i>
Boilers	Blow down boiler	Inspect Linkages	Check all Re-sets	Oil motors & linkages		City Inspection
AHU's	Visually inspect for proper operation	Check belt for proper tension	Apply belt dressing as needed	Grease motor		
Exhaust Fans	Visually inspect for proper operation		Check belt for proper tension	Grease motor	Apply belt dressing as needed	Change belt
Filters		Visually inspect		Change filters		
Window A/C units	Visually inspect for proper operation		Washout filter during cooling season		Cover/uncover units at beginning & end of season	
Thermostats	Inspect for proper operation					Calibrate & check for proper air pressure
Condensate return pumps	Observe unit for proper operation			Grease motor		Check all electrical connections
Steam Traps	Observe for proper operation					Check with thermometer for proper operation
Supply & Return grilles						Vacuum grille & check screws holding grille
Air compressor	Check for proper operating pressure		Check belt for proper tension		Apply belt dressing as needed	Change Oil & filter Change belt
Zone Dampers	Visually inspect for proper operation				Oil linkages, Check entire range of motion	Recalibrate stroke of damper & check for adequate Air pressure

Reasons to Create a PM Schedule

- ◉ Reminder for Engineer to Perform PM
- ◉ Proof Of Compliance to CPS Standards
- ◉ Lengthens useful life of Equipment
- ◉ Equipment runs more efficiently
(*Saves Energy*)
- ◉ Looks Professional

Purpose of this Presentation?

- Give Engineers an Introduction to LEED
- Promote Awareness Among Engineers
- Meet People from Operations
- Voice Concerns to Representatives from Operations

References & Green Websites

- ◉ **Cps.edu/gogreen**
- ◉ **USGBC.org** (United States Green Building Council)
- ◉ **GBCI.org** (Green Building Certification Institute)
- ◉ **GBES.org** (Green Building Educational Services)
- ◉ **Greenglobes.com** (Canada's version of LEED)
- ◉ **Breeam.org** (Building Research establishment Environmental Assessment Method. UK's version of LEED)
- ◉ **Gbca.org** (Green Building Council Australia)
- ◉ **Vtvsa.org/index.php** (Vermont Superintendents' Assoc.)
- ◉ **Chicagorecycling.org**
- ◉ **jpmatuszak@cps.edu**



Questions?